The prevalence of *Linguatula serrata* nymphs in goats slaughtered in Tabriz, Iran

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Abstract During 1 year (April 2009–April 2010), the prevalence of *Linguatula serrata* (*L. serrata*) nymphs in liver and mesenteric and mediastinal lymph nodes (MLN) of 740 native goats of different sex and ages were examined in Tabriz, north west of Iran. Initially the organs were macroscopically examined for nymphal stage of *L. serrata* and then were digested by acid–pepsin method to further investigation. The prevalence rate was obtained 55.27%. The mesenteric lymph nodes (MLN) in 334 (45.13%), the lymph nodes (LN) in 102 (13.78%) and the livers in 8 (1.08%) goats out of 740 were infected with *L. serrata* nymphs. The results indicated a high rate of infection of LN in goats in this region of Iran.

Keywords Goat · Iran · *Linguatula serrata* · Prevalence · Tabriz

Introduction

Linguatula serrata is a parathropoda of the class Pentastomida. The adult parasites are ranging in length 1.8–2 cm in males and 8–13 cm in females and occur in the nasal and

paranasal sinuses of dogs and cats where it causes bleeding, catarrhal inflammation, and some impediment to respiration. Cattle, sheep, goats, rabbits, and other animals serve as intermediate hosts; fully developed nymphs, the form infective for carnivores, are found encysted in the lymph nodes (LN), liver, spleen, lungs and serous membranes (Soulsby 1982). Humans may be infected with linguatula either by ingestion of nymphs of *L. serrata* resulting in a condition called nasopharyngeal linguatulosis or Halzoun syndrome or by ingestion of infective eggs which develop in internal organs resulting in visceral linguatulosis. This parasite has also been reported in humans from different regions of Iran (Anaraki Mohammadi et al. 2008; Arbabi et al. 1996; Maleky 2001; Montazeri et al. 1997; Siavashi et al. 2002; Sadjjadi et al. 1998). Several studies have been conducted on the prevalence rate of *L. serrata* in dogs (Meshgi and Asgarian 2003; Tavassoli et al. 2000), camels (Oryan et al. 2008) buffaloes (Tajik et al. 2008), sheep, and goats (Esmail-Nia et al. 2000; Shekarforoush and Arzani 2008; Razavi et al. 2004). The aim of present study was to determine the prevalence rate of *L. serrata* nymphs' infestation in liver, mesenteric and MLN in goats that slaughtered at the new industrial slaughterhouse, Tabriz, Iran.

Materials and methods

During 1 year (April 2009–April 2010), 740 goats, 305 males and 435 females in four age groups (<1, 1–2, 2–3, and >3 years old) were randomly selected in different seasons of the year at the industrial Tabriz slaughterhouse.

Livers, mesenteric lymph nodes (MLN) and MLN of these animals were macroscopically examined for nymphal stage of *L. serrata*. Mesenteric and MLN were cut into

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small pieces and immersed in normal saline solution (0.9% NaCl) and left for 5–6 h to allow nymphs to come out from the tissues. Recovered nymphs were flattened, dehydrated in ascending grades of ethyl alcohol and cleared in creosote before examining under a stereomicroscope. The negative samples were digested in 200 ml of digestive solution containing 5 g of pepsin (7197, Merck®) and 25 ml 37% hydrochloric acid (317, Merck®) in 1,000 ml distilled water, and incubated at 37°C for 24 h (Razavi et al. 2004).

Livers examination was performed in two steps: (1) they were sliced in 4–5 mm thick and observed carefully to find the encapsulated or free nymphs; (2) 100 g of mixed sliced samples were digested in 200 ml of pre-heated digestive fluid (Razavi et al. 2004; Shekarforoush et al. 2001).

The statistical analysis was performed using SPSS software version 16 (SPSS, Inc, Chicago, IL). The Chi-square test was used to check the differences between the percentages. The data were analyzed using Chi-squared test.

Results

At present study 305 males and 435 female goats in four age groups (<1, 1–2, 2–3, and >3 years old) were randomly selected in different seasons of the year (185 goats in per season) at the Tabriz industrial slaughterhouse. The prevalence rate of *L. serrata* nymphs in liver, mesenteric and MLN in goats in different sex and age groups and different seasons are summarized in Tables 1, 2. 409 out of 740 (55.27%) goats were infected with nymph stages of *L. serrata*. 138 out of 305 males (45.24%) and 271 out of 435 females (62.29%) were found to be infected and this difference was statistically significant ($P < 0.05$). 334 out of 740 (45.13%) goat had nymphs in their mesenteric lymph nodes. 102 out of 740 (13.78%) goat had nymphs in their MLN. Eight out of 740 (1.08%) goats had nymphs in their livers.

Season was also a significant factor in the prevalence of *L. serrata* mesenteric and MLN ($P < 0.05$). The infection was seen more in fall in LN and liver.

Discussion

The prevalence of linguatulosus in goats has been reported from different regions in Iran and other countries. The prevalence of 49.1% in Kerman, 29.9% in Shiraz, 0% in Shahrekord, 68% in Urmia city, 28.9% in Jordan, and 37% in Turkey has been reported (Dincer 1992; Nouroollahi Fard et al. 2010; Razavi et al. 2004; Sherkov and Rabie 1976; Tavassoli et al. 2007). In this study, the prevalence of 55.27% was observed in goats. This rate is higher than the previous studies in Iran and other countries. This difference probably indicates a regional difference in parasite distribution and its transmission life cycle. High rate of infection of goats indicates high infection rate of dogs with *L. serrata* in the study area and its close contact with goats herds.

The results of this study indicate a high infection rate of mesenteric lymph nodes of goats (38.57%) in this region of Iran. This prevalence rate is considered an important risk factor for human being infection and shows that Tabriz is an endemic area for linguatulosus. As several cases of *L. serrata* (Halazoun syndrome) were previously reported in human from Tabriz and other parts of north west of Iran (Jamali 1991; Hodjati and Naghili 1987; Montazeri et al. 1997).

Also the infection rate in female goats was significantly ($P < 0.05$) higher than of males. This finding is similar to results of survey in Kerman (Nouroollahi Fard et al. 2010). The cause of this difference in infection rate in genders seems to be due to the higher mean age of females than males at slaughtering.

According to this study, 45.13% of mesenteric lymph nodes and 13.78% of mediastinal lymph nodes and 1.08% of livers in goats had *L. serrata*. This finding is similar to Nouroollahi Fard et al. (2010) and Razavi et al. (2004) findings and is adversed to research of Shekarforoush et al. (2001) who reported infestation rate to nymph of *L. serrata* in liver of goats was higher than mediastinal lymph nodes (Nouroollahi Fard et al. 2010; Razavi et al. 2004; Shekarforoush and Arzani 2008). The prevalence rate of mesenteric lymph nodes was higher because of its location in the

Table 1 The prevalence of *L. serrata* nymphs in goat slaughtered at Tabriz industrial slaughterhouse, Iran

Age groups (years)	Male				Female			
	No. of animals	No. of infected MLN (%)	No. of infected LN (%)	No. of infected livers (%)	No. of animals	No. of infected MLN (%)	No. of infected mediastinal LN (%)	No. of infected livers (%)
<1	127	31 (24.40)	11 (8.66)	0 (0)	145	59 (40.68)	18 (12.41)	0 (0)
1–2	87	38 (43.67)	14 (16.09)	2 (2.29)	132	87 (65.90)	17 (12.87)	1 (0.75)
2–3	59	27 (45.76)	8 (13.55)	0 (0)	93	45 (48.38)	13 (13.97)	2 (2.15)
>3	32	16 (50)	6 (18.75)	1 (3.12)	65	31 (47.69)	15 (23.07)	2 (3.07)
Total	305	112 (36.72)	39 (12.78)	3 (0.98)	435	222 (51.03)	63 (14.48)	5 (1.14)

Table 2 The prevalence of *L. serrata* nymphs in different seasons in goats slaughtered at the industrial slaughterhouse, Tabriz-Iran

Season	No. of sheep	No. of infected MLN (%)	No. of infected LN (%)	No. of infected livers (%)
Spring	185	71 (38.37)	26 (14.05)	2 (1.08)
Summer	185	96 (51.89)	23 (12.43)	2 (1.08)
Fall	185	103 (55.67)	36 (19.45)	3 (1.62)
Winter	185	64 (34.59)	17 (9.18)	1 (0.54)
Total	740	334 (45.13)	102 (13.78)	8 (1.08)

way of portal circulation and infected as the first sites before the liver and other viscera.

The prevalence of linguatulososis in different seasons was significantly different ($P < 0.05$). The infection was seen more in fall in LN and liver. This result is similar to results of similar survey which was achieved in Kerman in goats. It was not clear but it seems that close contact between dogs and sheep throughout a year and geographical limitations caused it. In this area, because of the regular migration of tribes with their herds and dogs which they feed uncooked offal may contribute to the infection and spread of infection over the area. There is continuous contact between sheep and goats with final host (dog).

In total the results of this study support the impression that Tabriz is an endemic region for linguatulososis and due to zoonotic nature of the parasite and the risk of infection to humans and other animals preventive procedures are necessary for braking the cycle of the parasite.

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